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### Research Note

## *Piscicola reducta* (Hirudinea: Piscicolidae) from Fishes in a Subtropical Florida Stream

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**ABSTRACT:** The leech *Piscicola reducta* was found on the fins of 39 of 114 fishes collected from Blackwater Creek, Florida, from October 1982 to July 1983. Six species of fish were infested: *Pomoxis nigromaculatus*, *Erimyzon sucetta*, *Tilapia aurea*, *Lepomis gulosus*, *L. auritus*, and *L. punctatus*. The former 5 species and *Micropterus salmoides*, taken in a Hillsborough River collection, represent new host records. For the commonly collected fish species, prevalence (81.8%) and mean intensity (4.4) of *P. reducta* was highest on *L. gulosus*, followed by *L. auritus* (32%, 1.6) and *L. punctatus* (30.6%, 1.7). Considering all fish species, the caudal fin was the most common infestation site (49.4%), followed by the dorsal (23.1%), anal (13.2%), pectoral (9.9%), and pelvic fins (4.4%). This differential distribution on fins may be caused by differences in fin surface areas and movement and placement of fins associated with fish movements.

**KEY WORDS:** Hirudinea, *Piscicola reducta*, prevalence, intensity, survey, freshwater fish, Florida.

*Piscicola reducta* Meyer, 1940, is a widely distributed freshwater leech, reported from 19 states in the United States and 1 province in Canada east of the Rocky Mountains. It has low

host specificity and has been found on 19 species in 6 genera and 4 families of fishes (Table 1). The purposes of this paper are to report an extension of the geographical range of *P. reducta* into Florida, report 6 new host records, and describe the prevalence and intensity of this parasite for a fish community in a small stream in west central Florida.

Blackwater Creek (28°10'N) is a tributary of the Hillsborough River and drains land in Hillsborough and Polk counties, Florida. The study site (Sec. 9, R. 21E., T. 27S., Hillsborough Co., Florida) was 4–12 m wide, consisted of a series of shallow (1–2 m deep) pools connected by riffles and contained patches of submergent vegetation (*Egeria densa*, *Potamogeton illinoensis*, *Vallisneria neotropicalis*). Riffle substrate consisted of boulders and gravel, whereas sand, silt, and leaves covered the bottom of pools. Fish collections were made in October 1982 and January, February, April, and July 1983. Fish were collected by electroshocking (mean operating time per col-

Table 1. Fishes of North America previously reported to be hosts of *Piscicola reducta*.

Host	Locality	Reference
Cypriniformes		
Cyprinidae		
<i>Notemigonus crysoleucas</i>	Maine	Meyer, 1954
<i>Notropis atherinoides</i>	Kentucky	White and Crisp, 1973
Siluriformes		
Ictaluridae		
<i>Ictalurus melas</i>	Kansas	Harms, 1959, 1960
	Georgia	Booth and Aliff, 1978
<i>I. punctatus</i>	Kansas	Harms, 1959, 1960
	Oklahoma	Nagel, 1976
	Kansas	Wetzel, 1982
Perciformes		
Centrarchidae		
<i>Lepomis cyanellus</i>	Michigan	Klemm, 1972
<i>L. macrochirus</i>	New Jersey	Meyer, 1946
	Wisconsin	Petty and Magnuson, 1974
<i>L. punctatus</i>	Georgia	Booth and Aliff, 1978
Percidae		
<i>Etheostoma blennioides</i>	Kentucky	Bauer and Branson, 1975
	Tennessee	Bauer, 1976
	West Virginia	Murray et al., 1977
<i>E. caeruleum</i>	Kentucky	Bauer and Branson, 1975
	Minnesota	Erickson, 1976
	Kentucky	Kozel and Wittaker, 1982
<i>E. stigmaeum</i>	Kentucky	Bauer and Branson, 1975
<i>E. virgatum</i>	Kentucky	Bauer and Branson, 1975
<i>E. zonale</i>	Kentucky	Bauer and Branson, 1975
	Minnesota	Erickson, 1976, 1978
<i>Percina aurantiaca</i>	Tennessee	Bauer, 1976
<i>P. copelandi</i>	Tennessee	Bauer, 1976
<i>P. caprodes</i>	Kentucky	White and Crisp, 1973
	Kentucky	Bauer and Branson, 1975
	Tennessee	Bauer, 1976
	Ohio	White, 1977
	West Virginia	Schramm et al., 1981
<i>P. evides</i>	Kentucky	Bauer and Branson, 1975
	Minnesota	Erickson, 1976
	Tennessee	Bauer, 1976
<i>P. maculata</i>	Kentucky	Bauer and Branson, 1975
	Minnesota	Erickson, 1976
	Tennessee	Bauer, 1976
<i>P. phoxocephala</i>	Illinois	Meyer, 1940; Page and Smith, 1971
	Minnesota	Erickson, 1976
<i>P. sciera</i>	Illinois	Page and Smith, 1970
*	Canada, Ontario	Klemm, 1972
*	Minnesota	Klemm, 1977
	New York	
	Pennsylvania	
*	Arkansas	Klemm, 1982
	Louisiana	
	Massachusetts	

\* No hosts cited.

lection—23.0 min), transported alive in individual containers to the laboratory, and measured (standard length to nearest millimeter). Within 2 hr of capture, the external surface, gills, and mouth of each fish were examined for leeches

using a dissecting microscope. Leeches were removed, narcotized gradually in increasing concentrations of ethanol, fixed in 10% formalin, and then transferred to 70% ethanol. Representative specimens of *P. reducta* were deposited as

**Table 2. Prevalence (%) and mean intensity of *Piscicola reduta* on fishes from Blackwater Creek, Florida.\***

Fish species	Mean length (mm) $\pm$ 1 SD (range)	No. examined	No. infected (prevalence)	Mean intensity $\pm$ 1 SD (range)
<i>Erimyzon sucetta</i>	110.0 $\pm$ 49.5 (75–145)	2	1 (50.0)	3.0
<i>Lepomis auritus</i>	91.8 $\pm$ 17.4 (46–121)	25	8 (32.0)	1.6 $\pm$ 1.3 (1–5)
<i>Lepomis gulosus</i>	76.5 $\pm$ 18.9 (56–105)	11	9 (81.8)	4.4 $\pm$ 2.4 (1–8)
<i>Lepomis punctatus</i>	78.7 $\pm$ 17.8 (41–125)	62	19 (30.6)	1.7 $\pm$ 1.3 (1–6)
<i>Pomoxis nigromaculatus</i>	100.0	1	1 (100.0)	2.0
<i>Tilapia aurea</i>	76.0 $\pm$ 25.1 (50–100)	3	1 (33.3)	1.0

\* Fishes on which *P. reduta* was not found: *Amia calva*, 1; *Aphredoderus sayanus*, 1; and *Ictalurus natalis*, 8.

accession No. USNM 151916 in the Hirudinea Collection, National Museum of Natural History, Washington, D.C. 20560.

The terms prevalence and mean intensity follow the definitions of Margolis et al. (1982). The following statistical tests were performed: correlation and Chi-square analyses. Correlation analysis was used to ascertain relationships between prevalence and intensity of infestation and host size. It was also used to determine relationships between host fin size and type and intensity of infection. The distribution of leeches on host fins was examined using Chi-square analysis. Values were considered statistically significant at  $P < 0.05$ .

*Piscicola reduta* was found on 6 of 9 species of fishes collected in Blackwater Creek (Table 2) as well as on the largemouth bass, *Micropterus salmoides*, taken from a single collection at a downstream site in the Hillsborough River in July 1984. All infested species represent new host records with the exception of *Lepomis punctatus*.

Thirty-nine (34%) of the 114 fish examined were infested with 1 or more leeches. Prevalence and mean intensity for each host are given in Table 2. Among the 3 most commonly collected fish species, *P. reduta* exhibited the highest prevalence (81.8%) and mean intensity (4.4) on the warmouth, *Lepomis gulosus*. Parasite loads were low for all hosts with 54% of infested fish harboring only 1 leech, 15% had 2 leeches, 13% had 3, and 18% had 4 or more leeches.

For other studies in which relatively large numbers of hosts (15+) were examined, prevalences of *P. reduta* varied greatly, ranging from 3% for the channel catfish, *Ictalurus punctatus*, and black bulkhead, *Ictalurus melas*, in Kansas (Harms, 1959) to 70% for the banded darter, *Etheostoma zonale*, in Minnesota (Erickson, 1976, 1978). Mean intensities and ranges reported previously were similar to those found in

the present study (Harms, 1959; Page and Smith, 1970, 1971; Bauer and Branson, 1975; Bauer, 1976; Erickson, 1976; Booth and Aliff, 1978; Kozel and Whittaker, 1982). *Piscicola reduta* is a host generalist that appears to exhibit low infestation intensities.

To examine the relationship of prevalence of *P. reduta* to fish length, the 2 most commonly collected species were assigned separately to 10-mm length classes except for the largest and smallest individuals (excluded due to small sample size). Sample sizes of *L. gulosus* were too small to test statistically. No significant correlation existed between prevalence and fish size for either *L. punctatus* or *L. auritus*. There was no significant correlation between leech numbers and individual lengths for each of the 3 species of *Lepomis*. Page and Smith (1970) reported that *P. reduta* was more numerous on larger than smaller *Percina sciera*.

*Piscicola reduta* was found only on the fins, generally with its anterior end pointing toward the posterior end of the fish. Considering all fish species, leeches were most commonly located on the caudal fins, followed by the dorsal, anal, pectoral, and pelvic fins (Table 3). Individual host species followed this distributional pattern with minor variations. This difference in leech distribution was significant for *L. punctatus* and *L. gulosus* (Chi-square test = 20.8, 23.5,  $P = 0.0001$ ). Number of leeches on the fins of *L. auritus* were too small to test statistically. Most previous studies have reported this leech infesting the fins only, usually the caudal fin (Page and Smith, 1970, 1971; Bauer and Branson, 1975; Bauer, 1976; Erickson, 1976; Schramm et al., 1981). However, other sites of infestation have been reported: bases of fins and ventral part of head (Harms, 1959; Page and Smith, 1971), gills (Klemm, 1972), and isthmus and mouth (Klemm et al., 1979).

**Table 3.** Infestation sites of *Piscicola reducta* on fishes from Blackwater Creek, Florida. Number of leeches is given with percentage of occurrence in parentheses.

	<i>L. punctatus</i>	<i>L. gulosus</i>	<i>L. auritus</i>	Others	Total
Pectoral fins	3 (9.4)	5 (12.5)	1 (7.7)	0	9 (9.9)
Pelvic fins	0	0	4 (30.8)	0	4 (4.4)
Dorsal fin	13 (40.6)	8 (20.0)	0	0	21 (23.1)
Anal fin	4 (12.5)	6 (15.0)	1 (7.7)	1 (16.7)	12 (13.2)
Caudal fin	12 (37.5)	21 (52.5)	7 (53.8)	5 (83.3)	45 (49.4)

The differential distribution of *P. reducta* on fins of fishes from Blackwater Creek appears to relate, in part, to differences in fin surface areas. Surface areas were calculated for the fins of 10 *L. punctatus* and 10 *L. gulosus* and the percentages of total fin area were as follows: dorsal, 30.3, 26.5; caudal, 26.0, 25.9; pectorals, 16.7, 19.2; anal, 13.6, 13.5; and pelvic, 13.4, 14.9; respectively. For *L. punctatus*, a significant positive correlation existed between percentage fin area and the number of leeches attached to fins ( $r = 0.96$ ,  $P = 0.01$ ). Larger fins, with greater surface areas, supported more leeches than smaller fins. Although leeches on *L. gulosus* followed this same trend, its correlation was not significant.

Movement and placement of fins during various locomotor activities of fish may also affect the attachment sites of *P. reducta*. Based on percentage surface area, the caudal fins of *L. gulosus* supported more leeches and the dorsal fins fewer leeches than would be expected. The caudal fin may provide the largest, most stable area for attachment since it is the only fin that is not collapsible. Observations of these species of sunfish indicate that individuals periodically collapse the anterior spinous part of the dorsal fin, increasing disturbance and reducing the surface area available for leech attachment. Few infestations occurred on the pectoral or pelvic fins of the species of *Lepomis*. The pelvic fins of these species are often pressed against the body and the pectoral fins are either held in a similar posture or are in near constant motion. Both activities could deter leech attachment.

Among species of *Lepomis*, there was a significant positive correlation between individuals harboring 2 or more *P. reducta* and the number of different fin types involved ( $r = 0.72$ ,  $P = 0.002$ ). More than 1 fin type was infested for 15 of 16 fish, which were parasitized by 2 or more leeches. These preliminary data indicate that spatial partitioning may be involved in the dis-

tribution of this leech on its hosts in Blackwater Creek. However, further investigations are needed to resolve this aspect of the ecology of *P. reducta*.

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### Research Note

## *Eubothrium salvelini* (Cestoda: Pseudophyllidea) in Brook Trout, *Salvelinus fontinalis*, from West-central Lower Michigan

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**ABSTRACT:** *Eubothrium salvelini* infected 39 of 166 brook trout collected in 1983 and 19 of 23 brook trout collected in 1991 from Sweetwater Creek in lower Michigan. The mean intensity of *E. salvelini* was higher in brook trout in 1983 than in 1991. The intensity of *E. salvelini* significantly increased with host length in 1983. Gravid *E. salvelini* infected the pyloric ceca. Sweetwater Creek flows into the Pere Marquette River, which empties into Lake Michigan. The occurrence of *E. salvelini* in brook trout in this small creek and its absence in resident brown trout and young salmon in the Pere Marquette River is discussed. The occurrence of *E. salvelini* in brook trout in North America is summarized.

**KEY WORDS:** *Eubothrium salvelini*, Cestoda, prevalence, intensity, *Salvelinus fontinalis*, brook trout, geographical distribution, Michigan.

The biology, systematics, and geographical distribution of the species in the genus *Eubothrium* Nybelin, 1922, have been discussed by Kennedy (1978), Andersen (1979), Andersen and Kennedy (1983), and Ching and Andersen (1983). During a parasitological survey of trout in west-central lower Michigan, brook trout, *Salvelinus fontinalis* (Salmonidae), were found to be infected with *Eubothrium salvelini* (Schrunk, 1790). This note reports on the host-parasite relationships of *E. salvelini* infecting wild brook trout in a small Michigan creek and summarizes the occurrence of *E. salvelini* in brook trout in North America.